

Db2 Continuous Delivery - New Function Levels

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What is the motivation ?

Db2 for z/OS

Market is demanding faster reaction to requirements



Migration to Db2 12 – 2 step migration

- “CM” or “NFM” acronyms are replaced by term **“function level & appropriate number”**
- Step 1: CATMAINT
 - New functions are not available
 - V12 starts with **V12R1M100** (formerly called V12 CM)
- Step 2: New **-ACTIVATE** command to replace CATENFM utility going forward
 - New functions are available at appropriate function level:
 - **V12R1M500** (formerly called V12 NFM)
 - Why **500**? NFM level of a server is already indicated **by 5 or above**, e.g. DSN11015
 - **-ACTIVATE** command allows you to go backward and forward:
 - TEST keyword is optional to see what is possible

-ACTIVATE FUNCTION LEVEL

```
DSN7100I -DB1A DSN7GCMD
```

```
-DB2A ACTIVATE FUNCTION LEVEL (V12R1M500)
```

```
*** BEGIN ACTIVATE FUNCTION LEVEL (V12R1M500)  
      FUNCTION LEVEL (V12R1M500) SUCCESSFULLY ACTIVATED  
      CATALOG LEVEL (V12R1M500)  
      CURRENT FUNCTION LEVEL (V12R1M500)  
      HIGHEST ACTIVATED FUNCTION LEVEL (V12R1M500)  
      HIGHEST POSSIBLE FUNCTION LEVEL (V12R1M500)
```

```
DSN9022I -DB2A DSNZACMD '-ACTIVATE FUNC' NORMAL COMPLETION
```

Continuous Delivery – four levels are important

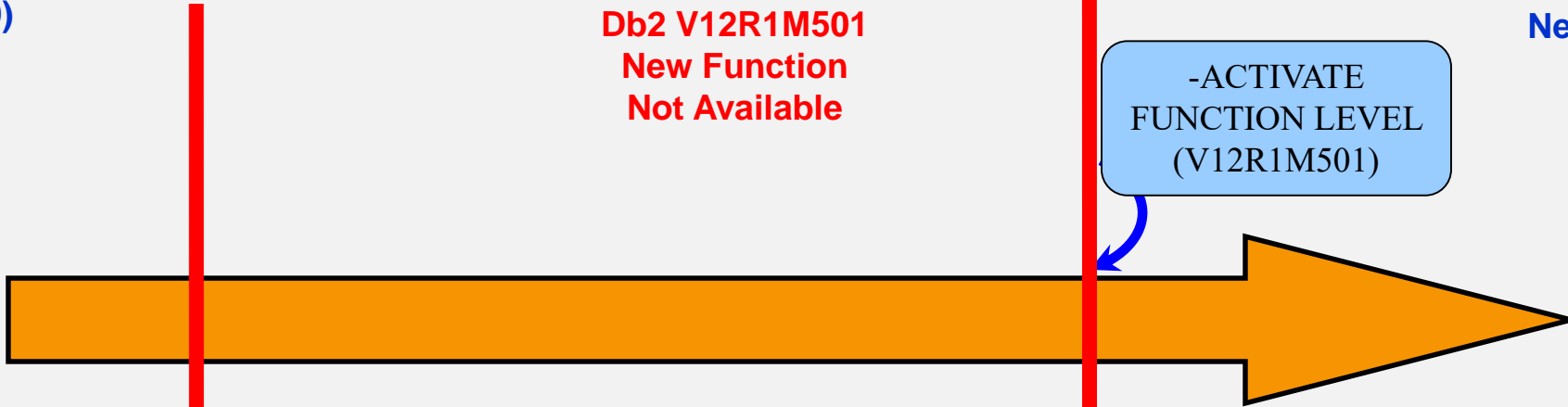
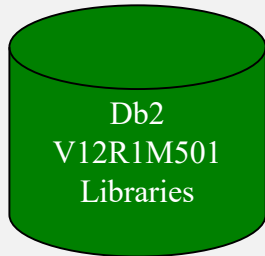
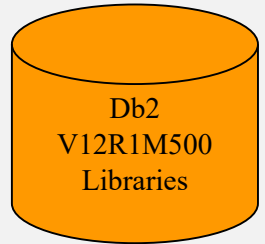
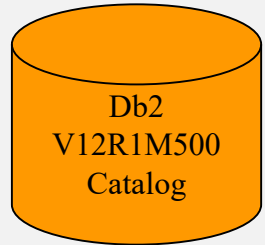
- System level:
 - **Module** or code **level** (ML)
SDSNLOAD, ...
 - **Catalog level** (CL)
CATALOG & DIRECTORY structure
 - **Function level** (FL)
Which new functionalities are enabled
- Application level:
 - **Application compatibility level** (AC)
APPLCOMPAT re-bind parameter
 - Precompiler/Coprocessor
SQLLEVEL (replaces NEWFUN) in DSNHDECP

New function activation no Catalog Change

Db2 12
(V12R1M500)

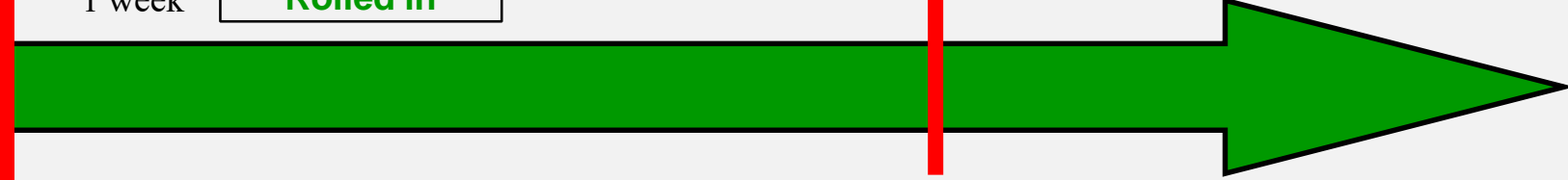
Db2 12R1M501
New Function
available

Db2 V12R1M501
New Function
Not Available



1 week

Maintenance
Rolled in



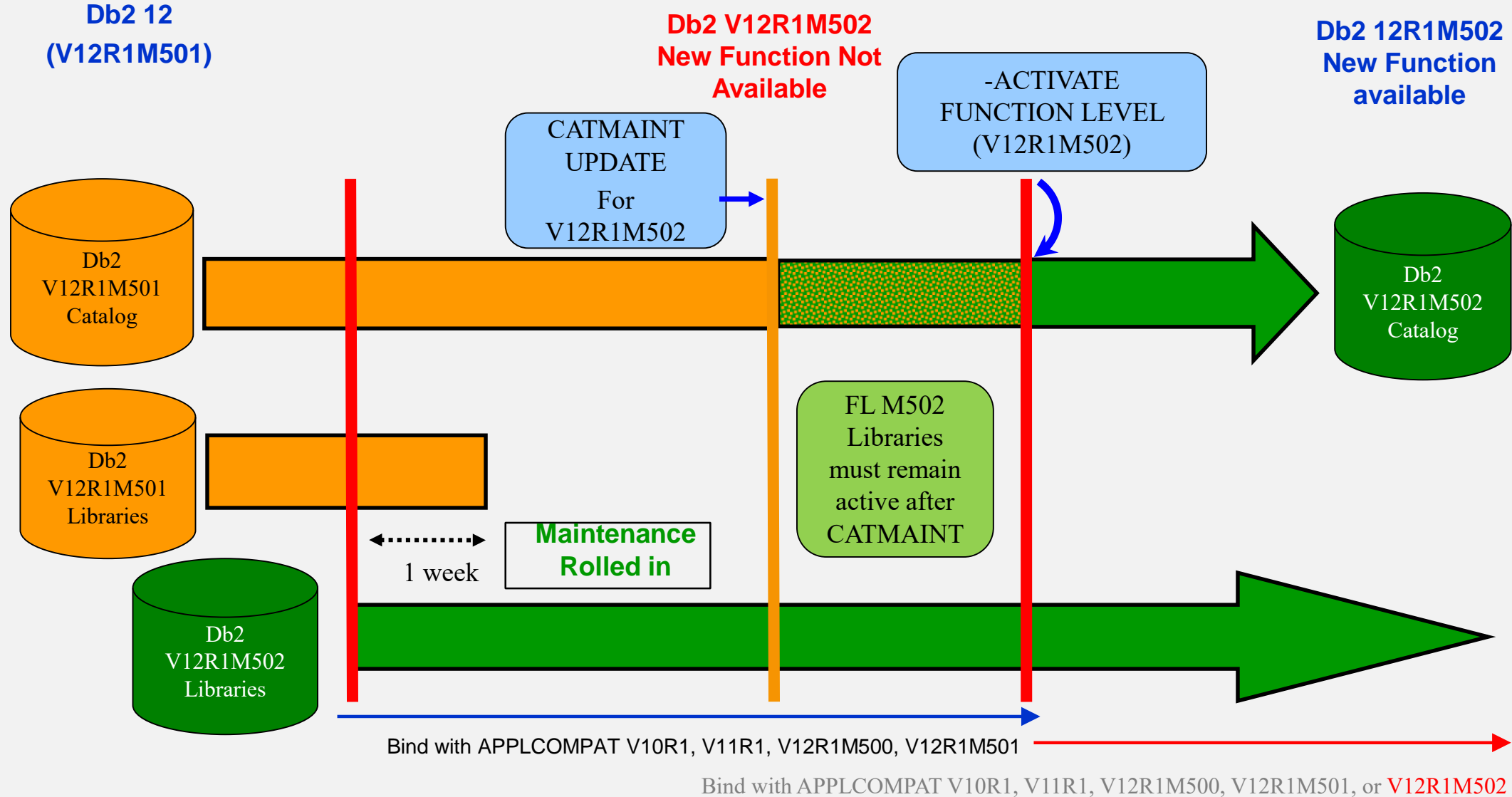
-ACTIVATE
FUNCTION LEVEL
(V12R1M501)

FL M501
Libraries
must remain
active

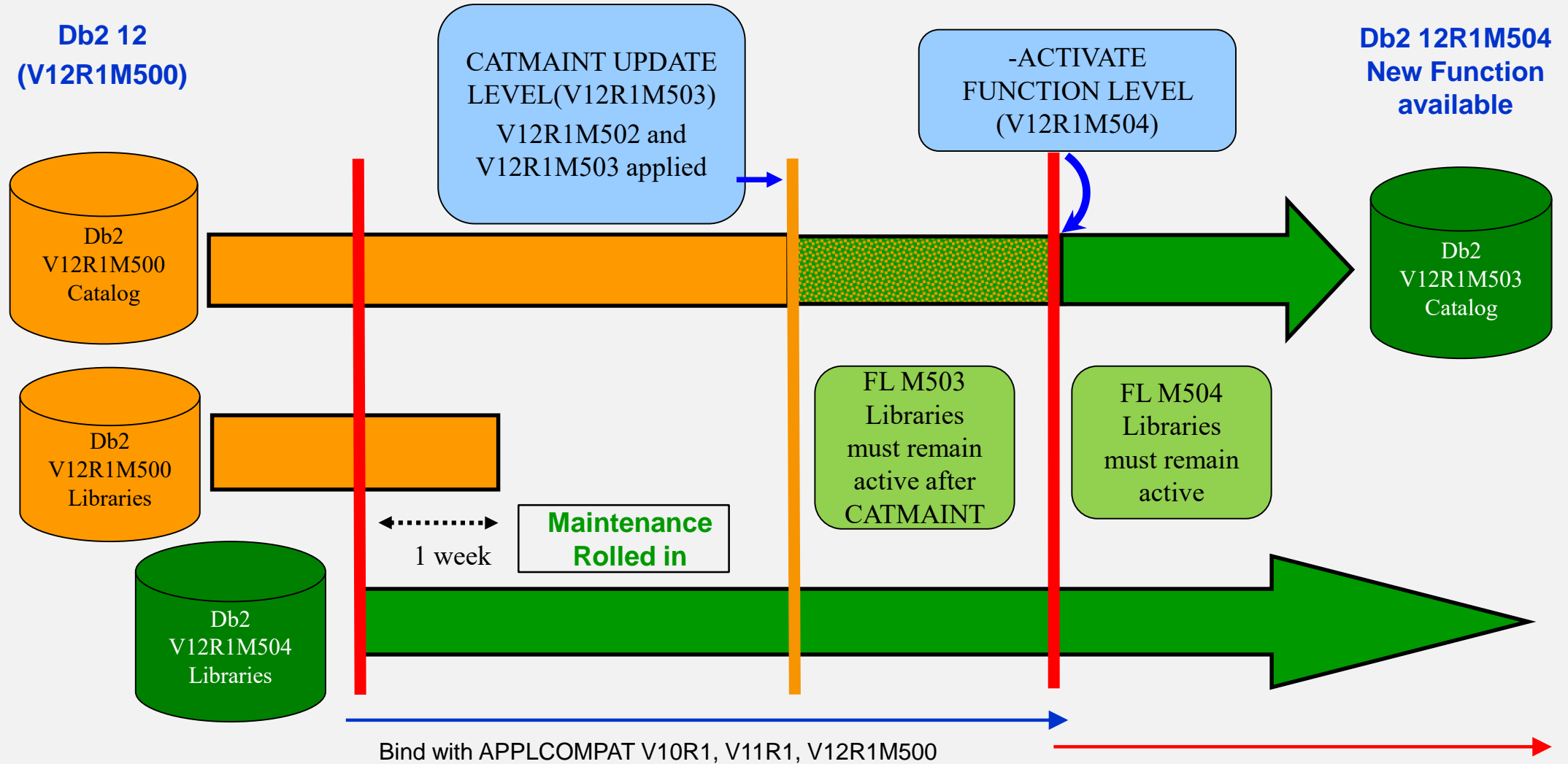
Bind with APPLCOMPAT V10R1, V11R1, V12R1M500
SET CURRENT APPLCOMPAT V10R1, V11R1, V12R1M500

Bind with APPLCOMPAT V10R1, V11R1, V12R1M500, or V12R1M501
SET CURRENT APPLCOMPAT V10R1, V11R1, V12R1M500, or V12R1M501

New function activation with Catalog Change

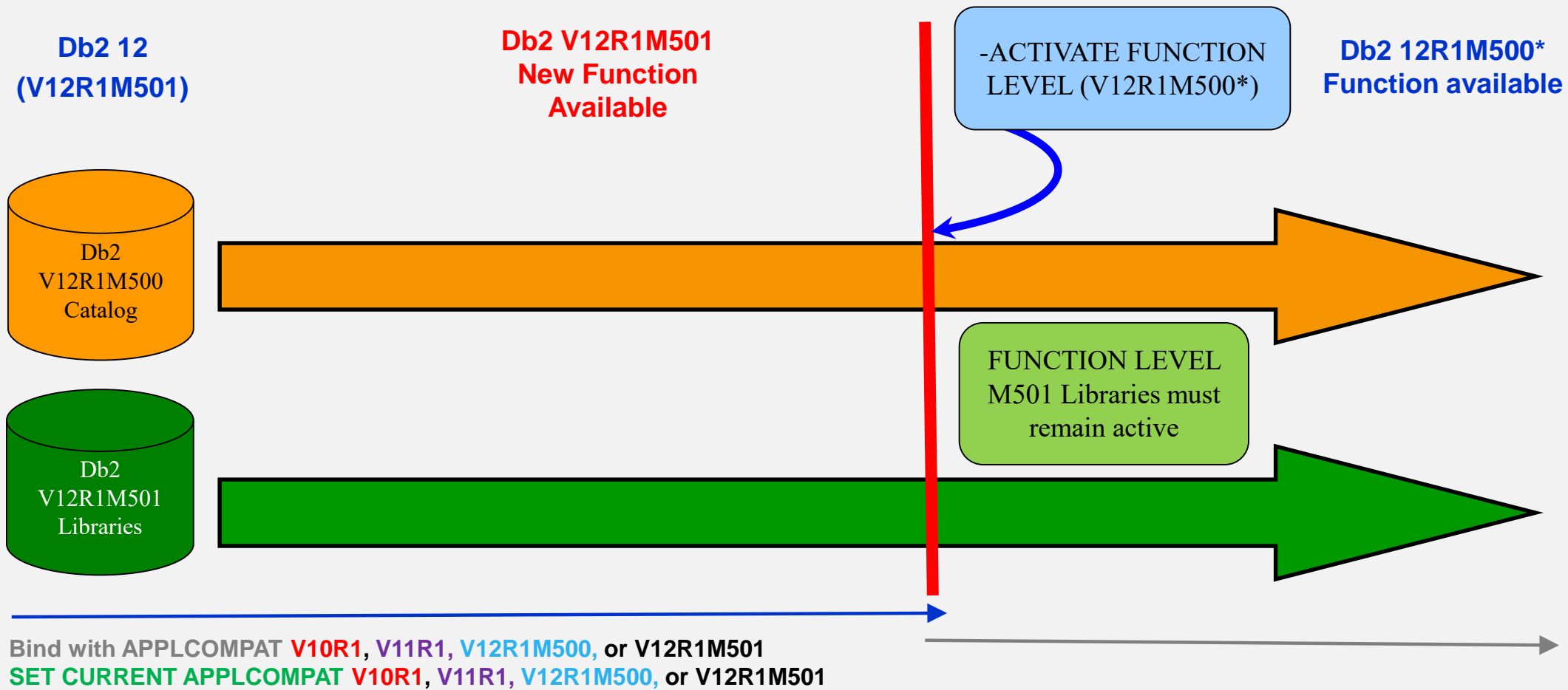


New function activation with Catalog Change – Skip FLs



Bind with APPLCOMPAT V10R1, V11R1, V12R1M500 – V12R1M502, V12R1M501 - V12R1M504

Function activation of Previous Level (* Mode)



-DISPLAY GROUP (new function not available)

Catalog level

DSN7100I -DB1A DSN7GCMD

```

*** BEGIN DISPLAY OF GROUP(.....) CATALOG LEVEL(V12R1M500)
      CURRENT FUNCTION LEVEL(V12R1M100)
      HIGHEST ACTIVATED FUNCTION LEVEL(V12R1M100)
      HIGHEST POSSIBLE FUNCTION LEVEL(V12R1M500)
      PROTOCOL LEVEL(2)
      GROUP ATTACH NAME(.....)
    
```

Function levels

-----					-----			
MEMBER	ID	SUBSYS	CMDPREF	STATUS	Db2 LVL	SYSTEM NAME	IRLM SUBSYS	IRLMPROC
-----					-----			
DB1A	1	DB1A	-DB1A	ACTIVE	121500	MVSA	DJ1A	DB1AIRLM
DB1B	2	DB1B	-DB1B	ACTIVE	121500	MVSB	DJ1B	DB1BIRLM
DB1C	3	DB1C	-DB1C	ACTIVE	121503	MVSC	DJ1C	DB1CIRLM
DB1D	6	DB1D	-DB1D	ACTIVE	121503	MVSD	DJ1D	DB1DIRLM
-----					-----			

```

SCA  STRUCTURE SIZE:      1024 KB, STATUS= AC,   SCA IN USE:      11 %
LOCK1 STRUCTURE SIZE:      1536 KB
NUMBER LOCK ENTRIES:      262144
NUMBER LIST ENTRIES:      7353, LIST ENTRIES IN USE:      0
*** END DISPLAY OF GROUP(DSNDB10 )
    
```

Module level

DSN9022I -DB1A DSN7GCMD 'DISPLAY GROUP ' NORMAL COMPLETION

Function Level Adoption – Consideration & Best Practices

- PTFs (RSUs...) are applied that may increase the Code or Module Level (ML) of a Db2 system
- After system is stable on maintenance, execute (If Any) catmaint
 - After execution of catmaint, the system can only be started with a ML that supports the catalog
- Activate Function Level
 - Function not related to SQL, DML, DCL syntax is available
 - REBIND of packages with any APPLCOMPAT would pick up optimizer enhancements
 - non-stabilized dynamic SQL would pick up optimizer / other non-APPLCOMPAT related enhancements

APPLCOMPAT Adoption – Best Practices

- After Function Level is considered stable - allow new application feature rollout.
 - REBIND DBA packages to allow new DDL to be utilized
 - REBIND application static packages with higher APPLCOMPAT to exploit DDL/DML new functions/behaviors
 - REBIND dynamic packages with higher APPLCOMPAT to allow new SQL functions to be used
 - REBIND distributed packages (***)in separate collection) to allow new SQL functions to be used
 - Switch applications to use new distributed package collection
 - Leverage PLANMGMT extended
 - REBIND SWITCH (PREVIOUS) to restore static to prior runtime structures
 - REBIND SWITCH (PREVIOUS) for dynamic would restore prior APPLCOMPAT
 - ***switching to prior collid for distributed dynamic would restore APPLCOMPAT

Static SQL, DDL, and DCL

- In Db2 11, Static SQL is controlled by APPLCOMPAT BIND option
- In Db2 11, DDL and DCL is controlled by CM/NFM
- Db2 12 needs to take into account function levels changing more often and the need to control applications use of new function across one or more function levels
 - In Db2 12, the APPLCOMPAT BIND option is extended to support function levels (e.g. V12R1M501)
 - In Db2 12, the APPLCOMPAT BIND option is extended to support DDL and DCL, in addition to DML

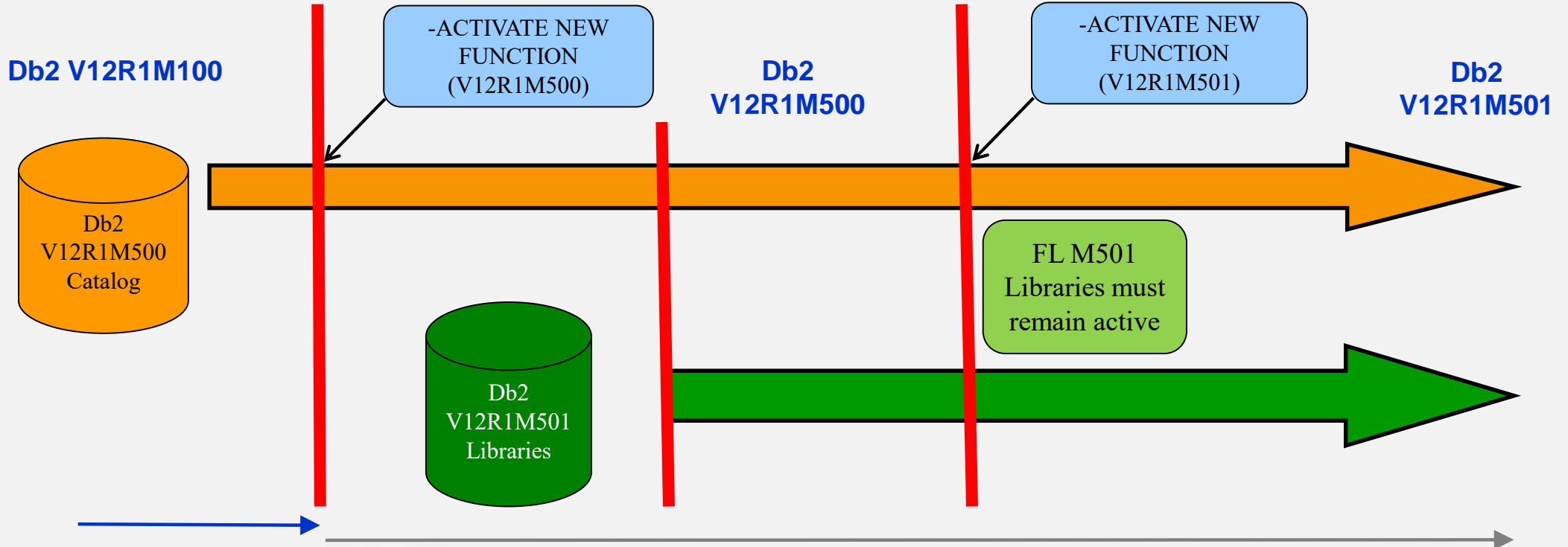
Dynamic SQL, DDL, and DCL

- In Db2 11, by default, Dynamic SQL executed under the APPLCOMPAT Bind Option
 - Could be V10R1 or V11R1
 - SET CURRENT APPLCOMPAT could be used to SET V11R1 if in NFM
- Db2 12 needs to take into account function levels changing more often and the need to control applications use of new function across one or more function levels
 - In Db2 12 the APPLCOMPAT BIND option is extended to support function levels (e.g. V12R1M501) for both STATIC and DYNAMIC SQL, DDL and DCL
 - The APPLCOMPAT BIND OPTION controls the MAX value that can be specified in SET CURRENT APPLCOMPAT
 - An APPLCOMPAT level will remain active even if the FL is lowered to a * mode (e.g. M501->M500*).
 - REBIND of the current APPLCOMPAT value is allowed even if the value exceeds the current *mode FL
 - SET CURRENT APPLCOMPAT continues to be allowed to be specified up to the value specified on BIND/REBIND

Db2 Client / Connect & Db2 FL501+ Consideration

- **Db2 Client / Data Server Driver/ Db2 Connect V11.1 FP1+**
 - **Required** for **FL501** and **APPLCOMPAT (V12R1M501)** or higher
 - Only adjacent Db2 Clients or DB2 Connect Server have to be on V11.1 FP1+
 - **APAR PH15092 required**
 - Introduces clientAppCompat as **optional** property
 - **APAR PH08482 required**
 - If clientAppCompat **IS NOT** used:
 - Direct connections and Db2 Connect server / gateways are supported
 - Any APPLCOMPAT level can be set! (must fit to activated FL)
 - If clientAppCompat **IS** used:
 - DRDA flow changes
 - Only direct connections are supported
 - Value must be at least V12R1M500 and not higher than APPLCOMPAT
- Older supported Db2 Client versions still work
 - If NULLID packages bound with APPLCOMPAT (V12R1M500) or lower

Data Server Drivers - Pre Db2 11 FP1*

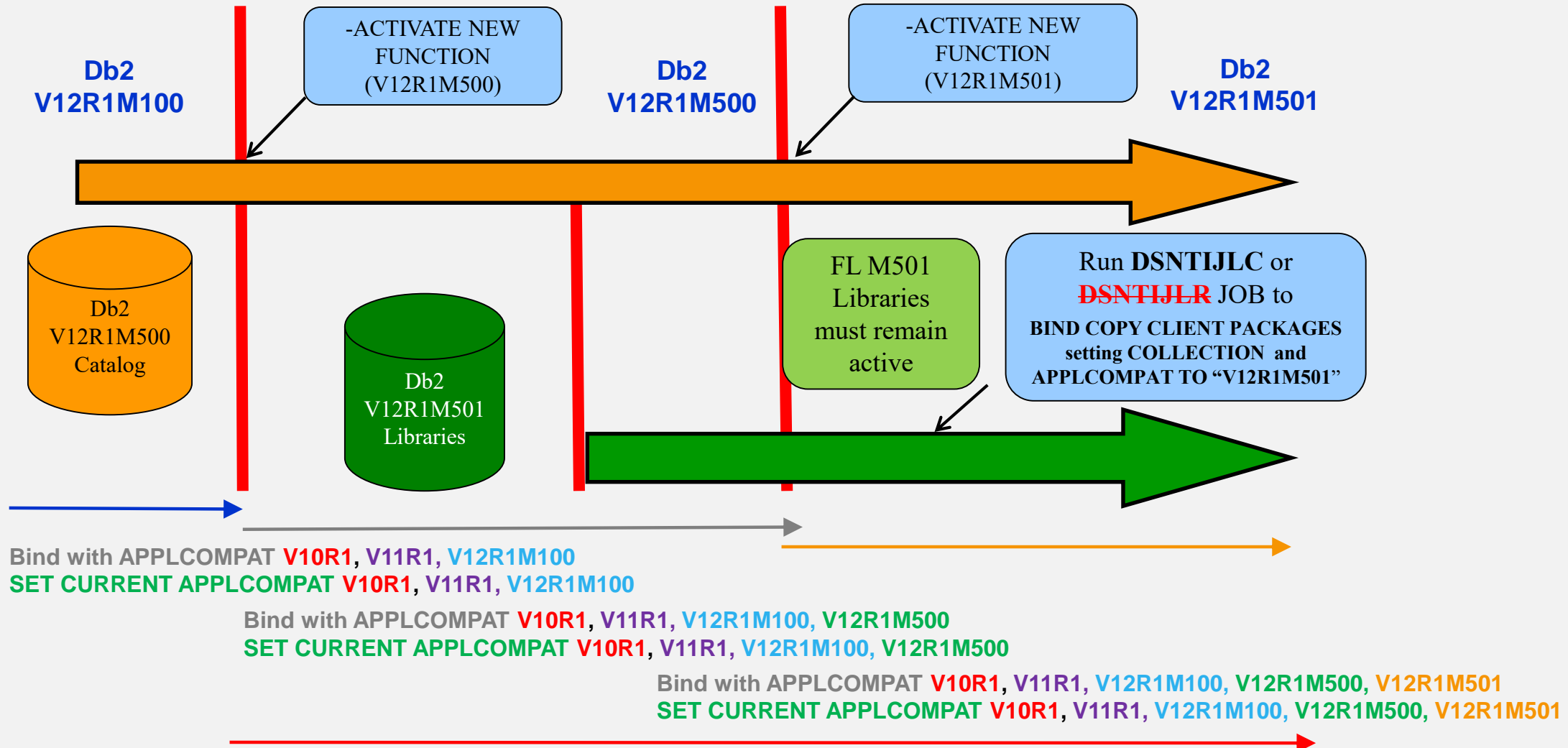


Bind with APPLCOMPAT **V10R1**, **V11R1**, **V12R1M100**
 SET CURRENT APPLCOMPAT **V10R1**, **V11R1**, **V12R1M100**

Bind with APPLCOMPAT **V10R1**, **V11R1**, **V12R1M100**, **V12R1M500**
 SET CURRENT APPLCOMPAT **V10R1**, **V11R1**, **V12R1M100**, **V12R1M500**

No change in client behavior
Server Capability is limited to APPLCOMPAT(V12R1M500)

Data Server Drivers - Db2 11 FP1(+)



No change in client behavior – No need to change clientApplcompat until a new DRDA flow is required

Db2 Connect and Continuous Delivery (Db2 12) Best Practice

- When migrating to Db2 12 - all DRDA applications could continue to use the driver packages in the NULLID collection
- These packages can have an APPLCOMPAT setting of V10R1, V11R1, V12R1M100 or V12R1M500 depending on where you are in the migration process
- Apply Apars PH15092 and PH08482
 - Make clientApplCompat optional, only adjacent client need to be on V11 FP1
- **Options:**
- Rebind driver packages in the NULLID collection and back level the APPLCOMPAT setting
This is a "one size fits all" solution to fallback to an earlier APPLCOMPAT
- “Penalty Box” the problem applications
 - Switch the problem applications out to use the driver packages in a different collection which has a back levelled APPLCOMPAT setting, or
 - Switch all the good applications out into a new collection using driver packages with the new APPLCOMPAT setting and leave the problem applications still using the driver packages in the NULLID or different collection but with the driver packages running a back levelled APPLCOMPAT setting

Function Level 501 in the Knowledge Center


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 - Function level 500 (activated at DB2 12 installation or aft
 - Function level 100 (activated by migration to DB2 12)
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 - + Adopting new capabilities in DB2 12 continuous delivery

DB2 for z/OS > DB2 for z/OS 12.0.0 > What's new in DB2 12 function levels >

»

Function level 501 (activation enabled by APAR PI70535)

Version 12.0.0 ▾ 

Function level 501 introduces the LISTAGG built-in function, which produces a list of all values in a group.

This topic contains the following sections:

- ▾ [The LISTAGG built-in function](#)
- ▾ [Function level 501 activation details](#)
- ▾ [Function level 501 incompatible changes](#)

